Zika Virus: Epidemiological Background

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Brief history

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1948 – Virus isolated from *Ae. africanus*
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Serologic evidence until 2007

- **Red**: Serologic evidence
- **Orange**: Virus detection or confirmed human case
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2015 – 1st cases in the Americas (arrival of the virus could have been in 2013)
Active Zika Virus Transmission

Zika virus

- Flavivirus
  - Dengue, West Nile, Japanese encephalitis, Yellow fever
- Primarily transmitted through the bite of an infected *Aedes* mosquito
  - Other modes: sexual transmission (importance?)
- Most common symptoms (usually mild): fever, rash, joint pain, conjunctivitis
- ~1 in 5 people infected with Zika virus present symptoms
Zika virus

- Treatment: there is no medicine to treat ZIKV
- Prevention:
  - There is no vaccine to prevent ZIKV
  - Reduce exposure to vector (repellent)
  - Vector control
    - Extremely unlikely to be successful without the provision of sanitation, regular access to piped water, and regular waste collection
A note on vector control

Aedes aegypti Distribution in the Americas

1930's 1970 2002
Global Distribution of *Aedes* Mosquitoes

Kraemer et al, 2015
Zika virus & complications

- Guillain-Barré syndrome (GBS)
  - Uncommon sickness of the nervous system
  - Evidence of a link between Zika virus infection and GBS in Brazil and French Polynesia

Guillain-Barré Syndrome outbreak associated with Zika virus infection in French Polynesia: a case-control study


Guillain-Barré syndrome associated with the Zika virus outbreak in Brazil

Síndrome de Guillain-Barré associada ao surto de infecção por vírus Zika no Brasil
Lucas Masiêro Araujo¹, Maria Lucia Brito Ferreira², Osvaldo JM Nascimento¹
Zika virus & complications

- Acute Disseminated Encephalomyelitis (ADEM)
  - Autoimmune syndrome that attacks the brain and spinal cord
  - Results presented April 10th at the annual conference for the American Academy of Neurology in Vancouver

Brazilian scientists find new Zika-linked brain disorder in adults

Zika virus may cause broader range of brain disorders than previously believed

Study says five patients who tested positive for virus in Brazil reported difficulty with motor functioning while another had trouble with vision and memory
Zika virus & complications

Feb 1, 2016 – WHO declared clusters of birth defects suspected of being linked to Zika virus in the Americas as a Public Health Emergency of International Concern

Microcephaly

Many cases have been reported:

- Presence of the virus in the placenta, in the amniotic fluid, in the blood of newborns, and in the brain and several organs of microcephalic fetus
- Asymptomatic Zika virus infections during pregnancy were also associated with fetal malformations
- Zika virus can cross the placental barrier at any time during the gestational period
Zika virus & complications

Zika virus impairs growth in human neurospheres and brain organoids

Patricia P Garcez1,2, Erick C Loiola2,3, Rodrigo Madeiro da Cunha1,2, Pablo Trindade2,3, Rodrigo Delvecchio3, Juliana M Nascimento2, Almir Suzano Tanuri2, Stevens K Rehen1,2

March 13, 2016

Zika virus infects human cortical neural progenitors and attenuates their growth

Honglin Tang1,11, Christy Hammond1,11, Sarah C Ogdon1,11, Zhexing Wen1,2,3,11, Xuyu Qian2,4,11, Yujing Li9, Bing Yao9, Jaeheon Shin2,4, Feiran Zhang9, Emily M Lee1, Kimberly M Christian9, Ruth A Didier10, Peng Jin9, Hongjun Song3,11,12, and Guo-li Ming9,2,3,4,11

Zika Virus Infection of the Central Nervous System of Mice

By

T. M. Bell, E. J. Field, and H. K. Narang

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With 8 Figures

Received February 10, 1971
Pressing questions (a sample)

- If a pregnant woman is infected with Zika virus and the baby is not born with microcephaly, will the child present with developmental problems later in childhood? Does the answer vary if the infection was asymptomatic?

- What is the risk of having a baby with microcephaly, after a Zika virus infection, considering when during the gestational period the infection took place? Does the risk vary if the infection was asymptomatic?

- Are there individual- or contextual-level factors that modify these risks? Does a previous infection with another pathogen (e.g., dengue), or a co-infection, increase the severity of Zika virus?
Zika and Health Systems

- Screening criteria
- Medical attention to children with microcephaly
- Reproductive health and rights
- Understanding and communicating the risk of microcephaly
- Vector control